

XIII.—On two new species of Calanidæ, with Observations on the Spermatic Tubes of *Pontella*, *Diaptomus*, &c. By JOHN LUBBOCK, Esq., F.Z.S.

[With a Plate.]

WHEN, in last March, I described the new species of *Labidocera*, which I proposed to call *L. magna*, I was only acquainted with the male, and was therefore anxious to find a female in order to complete the description of the species. This is the more necessary in the present genus, because the best specific characters are taken from the right anterior antenna of the male and the fifth pair of legs, organs which are dissimilar in the two sexes, and it is therefore evident that unless they are known in both, it would be very difficult to refer females to their respective males. Prof. Owen and Prof. Quekett, with their usual kindness, afforded me every facility, but I was unsuccessful in my search, and have never met with a second specimen. Dr. M'Donald, however, of H.M. steam-vessel *Torch*, has recently met with it in great numbers in the voyage from St. Vincent to Rio Janeiro, and a short description of it will be found in the Proceedings of the Royal Society for April 7, 1853. His paper is accompanied by drawings, to the beauty and general accuracy of which I can bear witness, from which it appears that the colour, as in *L. Darwinii*, is blue. *Anomalocera Patersonii*, which is the representative species in the North Atlantic, and appears to form the connecting link between *Labidocera* and *Pontella*, is also greenish blue. I think it likely that the other species are also bluish. Dr. M'Donald says, that when they were "placed in a vessel of sea-water, they rested on their antennæ on reaching the bottom, and paddled themselves about by their fore-limbs and tail." He has also an interesting observation on the superior development of the right side of the body; he "remarks that in all their movements the males exhibit a tendency to turn towards the left side, and concludes the rationale of this fact to be, that the brain on the right side being more developed at the part from which the right antenna derives its nerves, a corresponding preponderance is given to the power of the locomotive organs on that side."

Although however disappointed in my search for the females of *Labidocera magna*, I found in the same bottle two other species. The first is an aberrant species of *Pontella*, Dana, agreeing with that genus in the number of eyes, but very nearly resembling *Labidocera Darwinii* in the structure of the right male antenna, and is therefore a link between these two genera. The

second, on the other hand, is the type of a new genus which I propose to call *Monops* ( $\mu\acute{o}\nu\omicron\varsigma$ , one;  $\acute{\omega}\psi$ , eye). It differs from *Anomalocera* in having no superior eyes; and resembles *Labidocera magna* more than any other species that I know.

I will first give short specific descriptions of all the species at present known in which the anterior antenna is provided with dentated plates; then describe the two new species at length; and finish with a few words on the classification and geographical distribution of the group, with a comparison of all the right male antennæ.

*Pontella Bairdii*, n. s.

Antenna antica maris dextra duabus dentatis lamellis instructa, apicali long.  $\frac{1}{8\frac{1}{6}}$  unc. Spina prehensili parva, rigido crini simili. Ramo interno pedis postici maris sinistri, papilloso. Pede postico fœminæ long.  $\frac{1}{40}$ .

Color?

Long. cir.  $\frac{1}{5}$ .

*Hab.* Atlanticum oceanum, S. Lat. 20°, Long. 0°.

*Labidocera Darwinii*, Lubk.

Antenna antica maris dextra duabus dentatis lamellis instructa, apicali long.  $\frac{1}{100}$ . Spina prehensili parva, rigido crini simili. Ramo interno pedis postici maris sinistri, annuloso. Pede postico fœminæ long.  $\frac{1}{71}$ .

Cæruleo-viridis, interdum fusco maculatus.

Long. cir.  $\frac{1}{8}$ .

*Hab.* Atlanticum oceanum, S. Lat. 38°, W. Long. 65°.

*Labidocera Patagoniensis*, Lubk.

Antenna antica maris dextra tribus dentatis lamellis instructa. Spina prehensili magna. Pede postico maris sinistro; forti, ad apicem acuto et corneo, ramum internum non gerente. Pede postico fœminæ parvo, ramum internum non gerente.

Long. cir.  $\frac{1}{5}$ .

*Hab.* Atlanticum oceanum, S. Lat. 38°, Long. 65° W.

*Labidocera magna*, Lubk.

Antenna antica maris dextra quatuor dentatis lamellis instructa. Spina prehensili maxima, annulosa. Pede postico maris sinistro, magno, ad apicem tumido, papilloso; ramo interno nullo.

Long. cir.  $\frac{1}{4}$ .

*Hab.* Atlanticum oceanum, S. Lat. 18° 40', Long. 2° 30' W.

*Monops grandis*, n.s.

Antenna antica maris dextra duabus magnis dentatis lamellis in-

structa. Spina prehensili magna. Pede postico maris sinistro, parvo, non ad apicem tumido, non papilloso, ramo interno nullo.

Long. cir.  $\frac{1}{5}$ .

Hab. Atlanticum oceanum, S. Lat.  $18^{\circ} 22'$ , Long.  $2^{\circ} W$ .

*Pontella Bairdii.*

I now proceed to describe *P. Bairdii*, which I have so named in honour of Dr. Baird, who has done so much to increase our knowledge of the Entomostraca of this country.

This species agrees in most points very closely with *L. Darwinii*, but differs from it in having an inferior eye, besides the two superior; it belongs therefore to *Pontella*.

The cephalothorax has only six joints, the last having coalesced with the preceding. The anterior segment agrees with that of *L. Darwinii* in not having a spine directed outwards, as is the case in *L. magna* and *Patagoniensis*. The rostrum (Pl. V. fig. 5) is strong, deeply forked, and extends downwards as far as the inferior eye. Each fork is about  $\frac{1}{100}$  in length,  $\frac{1}{500}$  in breadth at the base, and  $\frac{1}{700}$  half way down.

The superior eyes are a good deal larger in the male than in the female. In one specimen they are bright violet, but in every other specimen the colour has been entirely removed; while the inferior eye, which is also violet, has in very many instances retained its colour.

The inferior eye is situated between the anterior antennæ, it is large, and, as remarked above, dark violet. It would be impossible to overlook it, even in the most cursory examination.

I shall refer to this point again when I consider the classification.

The anterior antennæ of the female and the left antenna of the male has on the internal side of the apex of the penultimate segment a long hair  $\frac{1}{66}$  of an inch in length, and the apical and antepenultimate segments have each a corresponding one  $\frac{1}{99}$  of an inch in length (fig. 6).

The right antenna of the male is formed upon the same type as that of *L. Darwinii*, from which it differs chiefly in the apical plate being longer, reaching nearly to the apex of the antepenultimate segment; and in the three apical segments being more pear-shaped, with the larger end in front. In some specimens the antenna was more swollen than in others, which perhaps may be accounted for by differences of age, or by the state of development of the spermatie tube.

The second pair of antennæ  $\frac{1}{31}$  in length.

The mandibles  $\frac{1}{66}$  in length, and the palpus also  $\frac{1}{66}$ . Each lobe of the palpus has six long plumose hairs, and the inner lobe also four smaller ones.

The first pair of maxillipeds  $\frac{1}{30}$ .

The second pair of maxillipeds  $\frac{1}{70}$ . The palpus is  $\frac{1}{66}$  in length, 4-jointed and tapering towards the apex; the other species of the genus have six segments to the palpus, and the joints which have disappeared are the two apical. The basal segment has a number of spines or small teeth on the inner edge. *L. magna* agrees with the present species in having also a few spines in the same place. In the arrangement and structure of the hairs, this organ agrees almost exactly with that of *L. magna*, except that the third hair has no spines above.

The third pair of mandibles  $\frac{1}{40}$ .

Thoracic legs. The first four pairs are adapted for swimming, as in the rest of the family, and are all alike, except that they increase in size from the first to the fourth, which are  $\frac{1}{22}$  in length. The large spines on the external margin of each leg are dentated above, and accompanied by a smaller spine on each side. All the appendages, from the second pair of antennæ to the fourth pair of thoracic legs inclusive, are very similar to those of the allied species.

The fifth and last pair is very different; its use in swimming, if any, is quite subordinate to its functions connected with the act of fecundation. In the female they are smaller and simpler than in the male, and symmetrical, while in the latter they are much more complicated, stronger, and asymmetrical, the right leg being the largest and forming a prehensile apparatus.

In the present species these legs of the female (fig. 4) are much larger than in *L. Darwinii* or *Patagoniensis*, measuring  $\frac{1}{40}$  in length. They most nearly resemble those of *L. Darwinii*, from which they only differ in their larger size, and in the external branch being longer and bearing three instead of two spines at the extremity.

The left leg of the male (fig. 3) consists of four joints as in the other species, but the second segment (counting from the base) appears both in this and in the corresponding right leg to be composed of two which have coalesced. It most resembles that of *L. Darwinii*, and, like it, bears two rami. I have already remarked the curious relation which appears to exist between this branch and the prehensile spine of the right male antenna, viz. that where one is developed the other disappears, and *vice versa*. This ringed branch is homologous with the inner ramus of the other thoracic legs, like which it is two-jointed. In the present species it is long, slender, tapering, and ringed, with the rings produced into papillæ. Like the corresponding organ of *L. Darwinii* it appears to be extensible, as the length and thickness vary in different specimens. Length  $\frac{1}{40}$ .

The right leg,  $\frac{1}{42}$  (fig. 3), also consists of four joints, but, as in

the left leg, the second (counting from the base) appears to be composed of two segments. The basal segment is attached by its external basal angle to the apex of a strong crescent-shaped process, the horns of which point inwards. The second is longer and thinner, and, as I have just noticed, appears to consist of two; it bears a strong spine at the external apical angle. The third is very strong and muscular, as in the other species of this genus; it is attached to the inner apical angle of the preceding segment. Besides the large claw at the base, which forms with the succeeding segment a prehensile apparatus, there is a smaller spine directed backwards. On the external margin, which in the ordinary position would be lowest, there are two rounded projections, of which the apical is the largest and appears to be transversely striated or furrowed. The portion which answers to the large moveable claw of the allied species is here, as in them, attached to the external apical angle of the third segment, but in the present species it gradually increases in size from the base, is produced at the apex into a large claw, which with the corresponding one of the third joint forms a prehensile apparatus, and appears to consist of three segments, of which the second and third bear a hair each, and the third a long cylindrical appendage, provided at the apex with a small spine and two hairs.

The abdomen (figs. 1 & 2) is entirely without legs. That of the male consists of four segments, terminated by two 2-jointed lamellæ, exactly as in *L. Darwinii*.

The abdomen of the female is two-jointed and swollen transversely. The right side is more swollen than the left, and bears on the back a large spine.

This appears to be the best place to mention what I have to say about the impregnation. There is a very interesting paper by Siebold in the 'Annales des Sciences Naturelles,' 1840, 2nd sér. t. xiv. p. 26, "Sur l'accouplement du *Cyclops Castor*;" and in order to make my own observations more intelligible, I shall quote a part of what he says, premising that the *Cyclops Castor* now forms the genus *Diaptomus*, and, with *Pontella*, *Cetochilus*, &c., has been separated from the old family, Cyclopidæ:—

"Ce qui passe pendant que ces animaux se tiennent ainsi embrassés est un des phénomènes les plus remarquables dans le règne animal, et dont on n'avait jamais eu une idée. Un tube cylindrique, rempli d'un liquide spermatique, s'échappe de l'ouverture sexuelle du mâle immédiatement après l'embrassement; le mâle saisit ce tube aussitôt qu'il est sorti et le colle contre le ventre de la femelle, audessous de la vulve. . . . .

"Chacun de ces tubes spermatiques renferme trois masses bien différentes entr'elles. Une des matières contenues est blancheâtre et épaisse; elle a la propriété de ne pas se dissoudre dans

l'eau, mais de s'y transformer en une masse visqueuse et solide. Cette masse ténace, coagulable dans l'eau, s'étend dans toute la longueur de la capsule. Une des deux autres matières est composée d'une foule de très petits corps ovales et bien contournés, ayant longueur de 0.0066 à 0.0070 de ligne anglaise: ils paraissent d'une forme aplatie. La troisième masse consiste dans une foule de corps ovalaires, dont les contours sont moins bien dessinés, et qui ne sont pas clairs comme ceux-ci, et sont composés de granules très-fins. Ces deux dernières masses se trouvent réparties dans la capsule d'une manière remarquable, et forment une couche très-mince placée sur la surface interne. Les corpuscules bien limités se trouvent dans la moitié supérieure de la capsule, tandis que les corpuscules granulés, bien séparés des autres, occupent la moitié inférieure; ces deux masses ne permettent donc pas que la portion ténace se trouve en contact avec la surface interne de la capsule. Enfin, le col de la capsule se trouve seulement rempli par de la substance visqueuse. . . .

" Aussitôt qu'un tube spermatique bien développé se trouve en contact avec de l'eau, les corpuscules granulés se gonflent (probablement par l'imbibition de l'eau), et ces corpuscules qui composent la matière expulsive, perdent leur forme ovulaire et deviennent ronds. Peu à peu leur aspect granulé s'efface, ils se transforment en vésicules, qui s'enflent de plus en plus, et ils finissent par expulser la matière glutineuse qui se trouve vers le col ouvert de la capsule, et qui peut facilement s'échapper. . . .

" La matière expulsive continue de s'enfler, quand même la matière glutineuse a déjà quitté la capsule; de sorte que cette matière chasse aussi tous les zoospermes, sans laisser seulement un corpuscule ovale dans la capsule. Quand tout est sorti hormis les grandes vésicules de la matière expulsive, celle-ci devient transparent comme de l'eau, et paraît composée de grandes cellules. Or, nous savons qu'avant cette transformation la capsule était blanchâtre."

In my paper on *L. Patagoniensis* I described and figured (Pl. X. fig. 2) a cylindrical appendage, situated on the back of the first abdominal segment, but was obliged to leave it doubtful, whether it was a spermatocyst or an external ovary, although I inclined to the former supposition. In the present species, however, I was more fortunate; for after looking through several hundred specimens, I found a male, from which the tube was in the very act of escaping, and also four females, each of which had one attached to them. Three of these are quite empty, and evidently are homologous with the cylindrical appendage of the *L. Patagoniensis*, as they exactly agree with it in texture and general appearance, and differ only slightly in shape and in position. It is evident, therefore, that the appendage of *L. Patagoniensis* is a true spermatocyst, and is only

anomalous in being attached to the back instead of underneath. The tube which was in the act of escaping from the male still retained its contents, which agree with Siebold's description. Using his nomenclature and letters of reference, *d* is the expelling matter (matière expulsive), *e* the glutinous substance (matière glutineuse), and *c* the zoosperms (zoospermes). I have already remarked that of a large number of females which I examined, four only were provided with one of these appendages; this is probably owing to their having been collected in the middle of June. Mr. Darwin's specimens of *L. Darwinii* having been caught in November, which answers to our May, would account for my never having found a fully developed spermatid tube in that species, and the only time that Dr. Baird ever met with a tube attached to *Diaptomus* was in October.

As, owing to an accident happening to the vessel in which his specimen of *Diaptomus* was contained, Dr. Baird says, he was "prevented from making any lengthened observations on it," and as I have heard of no one else who has studied the subject, I believe my observations are the first which fully confirm those of Von Siebold. The manner in which the three substances contained in the tube act in *Pontella* is probably the same as in *Diaptomus*. Jurine says, "il n'est pas rare d'en trouver avec deux, trois, quatre, même cinq tubes spermatiques collés autour de la vulve;" I, however, never met with a female, either of *P. Bairdii* or *L. Patagoniensis*, which had more than one tube. This mode of fecundation, which Siebold has truly observed, is one of the most remarkable phænomena in the animal kingdom, has now been observed in *Diaptomus Castor*, *Labidocera Patagoniensis*, *Pontella Bairdii*, *Calanus hyperboreus* (see the figures given in Gaimard's 'Voyage en Scandinavie'), and it probably occurs also in *L. Darwinii* and *Anomalocera grandis*, n. s., because in these species, as in the *P. Bairdii*, I have found in the posterior part of the cephalothorax, an organ which I am nearly sure is a spermatid tube in the course of formation, so that it will most likely be found to prevail throughout the whole family. The shape of the tube varied in the different specimens of the same species. Since the male orifice is situated between the second and third abdominal segments, as in *Cyclops*, it is evident that the inner branch of the left posterior leg in the male is not a true penis. The delicacy of the structure of this branch appears to indicate that it possesses the sense of touch in a high degree. I have already noticed the curious relation which appears to exist between it and the prehensile spine.

Length about  $\frac{1}{3}$ .

Hab. Lat. 18° 15' S., L. 2° 30' W. to 4° E.

From the Museum of the College of Surgeons. Collected by Sir E. Home.

## Genus MONOPS.

*Rostrum furcatum. Antenna antica maris dextra geniculans, tumida. Oculi superiores nulli. Oculus inferior unicus. Pes posticus maris dexter crassus prehensilis.*

These characters distinguish *Monops* from all the other genera in the family, but I shall presently give my reasons for considering this form as a new genus more at length. It is true that these are the characters of *Anomalocera* as given by Templeton, but that genus has in reality four superior eyes.

I have already given the specific character, and it is therefore unnecessary to repeat it here. In general appearance this species resembles *L. magna* more than any other species which I know, for which reason I have given it an analogous trivial name.

*The cephalothorax* is 7-jointed; the posterior segment is very small, the three anterior large and nearly equal to one another, the other three intermediate in size and also equal to one another. The force which has developed the right anterior antenna and the right posterior leg of the male more than the left, has had the same effect on the posterior angles of the cephalothorax; that on the right side is at least twice as long as the other. In the female they are symmetrical. The spines of the anterior segment do not project outwards, and therefore are not visible from above. The rostrum (fig. 7) is very deeply divided, and the two forks are very delicate, symmetrical, and curved towards each other. Each prong is  $\frac{1}{80}$  in length, at the base  $\frac{1}{1000}$ , at the middle  $\frac{1}{600}$ , and at the apex not more than  $\frac{1}{18,000}$  in diameter. Those of *L. magna*, on the other hand, are strong and short, being only  $\frac{1}{160}$  in length. (See Ann. and Mag. Ser. 2. vol. x. pl. X. f. 8).

*The anterior antennæ of the female* and the left one of the male have at the apex a very long hair  $\frac{1}{50}$  in length. The corresponding hair of the penultimate segment is  $\frac{1}{20}$ , and of the antepenultimate  $\frac{1}{30}$  (fig. 10).

*The right anterior antenna* of the male resembles that of *L. magna* more than that of the other species; it swells and contracts again, however, more abruptly than in that species. The prehensile spine is much smaller and not ringed. The plate belonging to the eighth segment (see the comparison of the right male antennæ in this genus) is not free at the base. The teeth are not so sharp. The eighth and ninth segments have coalesced, so that the hairs which belong to the latter appear to be situated on the former.

The sixth segment bears a very small plate with a few rather large teeth, analogous to the penultimate plate in *L. magna*. A glance at the figure will give a better idea of the general form of the organ than any description could convey.



The second pair of antennæ have thirteen long hairs at the end of the longer branch ; they are  $\frac{1}{3}$  of an inch in length.

The mandibles  $\frac{1}{3}$ . Palpus  $\frac{1}{6}$ . The rows of hairs which I have mentioned as present in *L. Patagoniensis* and *magna* are here much developed and form a strong brush.

First pair of maxillipeds  $\frac{1}{6}$ . The lobes are more divided than in the allied species. The spines on the inner edge are few in number, large, strong, curved, and clothed with short brown hairs.

Second pair of maxillipeds  $\frac{1}{10}$ . Palpus  $\frac{1}{10}$ . There are, as in *L. Patagoniensis*, seven hairs on the organ itself ; the external (nearest to the palpus) small, setose on both sides ; the next only half as long as the first. The next two very long, with inconspicuous hairs on the lower side. The fifth short, setose on each side, but chiefly below, the next only setose below. The internal setose on each side, but chiefly below. The last three hairs are about the same size, and half as long as the preceding. The palpus consists of four segments only, the basal and apical bearing at the apex two, the rest one hair each, all setose below.

Third pair of maxillipeds  $\frac{1}{4}$ . There are six of the smaller hairs plumose on each side. The larger hairs are beautifully crenate at the apex for about  $\frac{1}{3}$ rd of their length. The secondary spines of all the basal portion have disappeared.

Fifth pair of legs. Male (fig. 8). The left leg is much smaller than the right, and has no inner branch. The second segment has a spine externally at the apex. The third is small and bears the two tufts of hairs, and the fourth is very small, and bears at the apex a little tapering delicate lobe, which may, perhaps, be the rudiment of another segment,  $\frac{1}{8}$  of an inch.

The right leg (fig. 8) also consists of four segments ; the third, which in some species is so much swollen, is small, its office being probably in part transferred to the strong prehensile antenna. The fourth segment is small, and the spine of the third is very large and pointed, so that at first sight it might be mistaken for the fourth segment. The presence of two hairs on the smaller spine unmistakeably denote it to be the real homologue of the apical segment ;  $\frac{1}{6}$  in length when not extended.

In the female (fig. 9) they are  $\frac{1}{3}$  in length. The inner branch bifid at the apex ; the outer much-curved, also bifid at the apex, with a large spine on the inner and two very small ones on the outer side.

Abdomen. Female (fig. 11). Two-jointed, asymmetrical, the right side of the basal joint bearing a large slightly tapering lobe, about half as long as the succeeding joint.

The abdomen of the male (fig. 12) is similar to that of the

other species of the genus, except that on all my specimens there is a very short cylindrical appendage attached underneath to the third segment on the right side. A hemispherical portion at the end is very dark violet, covered with numerous small spines (fig. 13 *a*) and surrounded by a narrow light yellow border (*b*), on which they are rather larger and more scattered. There are a few hairs on the violet part. The end, therefore, resembles a hemispherical file, but I cannot offer the slightest suggestion as to its probable use. Mr. Darwin and Prof. Quekett have kindly examined it for me. The females have no such appendage.

Length about  $\frac{1}{2}$ .

*Hab.* Lat.  $18^{\circ} 15'$  S., Long.  $2^{\circ} 30'$  W. to  $4^{\circ}$  E.

From the Museum of the College of Surgeons. Collected by Sir E. Home.

#### EXPLANATION OF PLATE V.

- Fig. 1.* *Pontella Bairdii*. Abdomen. Male. *d.* Expelling matter. *e.* Glutinous matter. *c.* Zoosperms.  
*Fig. 2.* Ditto. Abdomen of female, seen from above. *a.* The empty spermatid tube.  
*Fig. 3.* Fifth pair of legs. Male.  
*Fig. 4.* One of ditto. Female.  
*Fig. 5.* Rostrum.  
*Fig. 6.* Four apical segments of the normal anterior antenna.  
*Fig. 7.* *Monops grandis*. Rostrum.  
*Fig. 8.* Fifth pair of legs. Male.  
*Fig. 9.* One of ditto. Female.  
*Fig. 10.* Four apical segments of normal anterior antenna.  
*Fig. 11.* Abdomen. Female. Seen from above.  
*Fig. 12.* Ditto. Male. Seen from the side and below.  
*Fig. 13.* A small piece of the dark part of the abdominal appendage of ditto.

[To be continued.]

#### XIV.—Notes on some new or little-known Marine Animals.

By P. H. GOSSE, A.L.S.

To the Editors of the *Annals of Natural History*.

GENTLEMEN,

THE expectation which I ventured to express in your Magazine for last October has been amply realized. Marine animals and plants have been exhibited in London, in their native health and beauty, in circumstances where their various functions and instincts can be carried on under the eye of the naturalist; and the inhabitants of the metropolis have enjoyed a sight of the curious